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How the Ancients Made Cement

10/10/2021 1 Comment

5 limecrete recipes from the world's oldest buildings.

There are many builder myths swimming about in the cement mixer of concrete history. One of them is that the Romans invented concrete. They didn't. They created a specific kind of

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limecrete, which differs considerably to the Portland cement of today. Also, it's highly unlikely that they invented the stuff. There's plenty of archaeological evidence to show other peoples were using limecretes and mortars way earlier. Lime mortars can be found in Syria dating as far back as 6500BC, and in Europe on the banks of the Danube limecrete floors in huts were found dating back to 5600BC. So the Romans were late to the limecrete party. But they *did* create some very interesting recipes. They weren't the only ones though.

Can my limecrete hold up to the ancients'? I doubt it.

How did the ancients make limecrete?

This week in answer to a question about pozzolans, I found myself diving down some dusty old rabbit holes in search of the first limecrete recipes. What a wonderful time I had! And what I stumbled upon was so interesting, I decided to share it. The bottom line is there's no single way to make limecrete. So many pozzolans. So many options:)

Huh? What's a pozzolan?

Right, let's get back to some cement foundations: Lime,

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Author

Atulya K Bingham
Natural builder and author of **Mud Ball.**

lime mortar, limecrete

There's lime, lime mortar and limecrete. They're all different. Lime is basically burnt limestone (you can read more about the different limes and how they are made in my article **here**). When you slake burnt limestone you get a putty. If you mix this with sand or earth, you can make a basic mortar for stone walls.

Limecrete

When you mix that same lime putty with something called a pozzolan, a chemical reaction occurs which turns the lime into a cementitious substance. This is a very simplified account, but it gives you a general idea. If you're serious about using lime, check out my **Amazing World of Lime** course though.

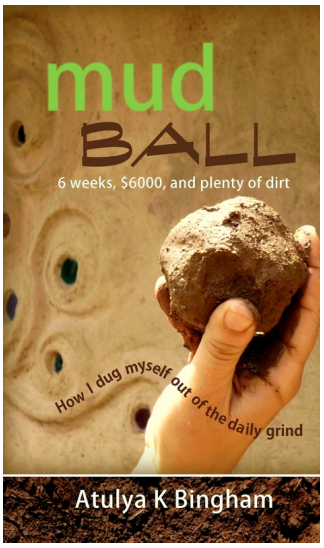
5 Ancient Limecrete Recipes

With that all under our belts, here are five ancient world limecrete/mortar recipes you might like to try (sometimes the ancients used limecrete as mortar, as we do today).

Photo by Simon Berger.

1. Ancient Egypt: Limecrete Pyramids?

This is possibly the most mysterious of all the limecrete stories



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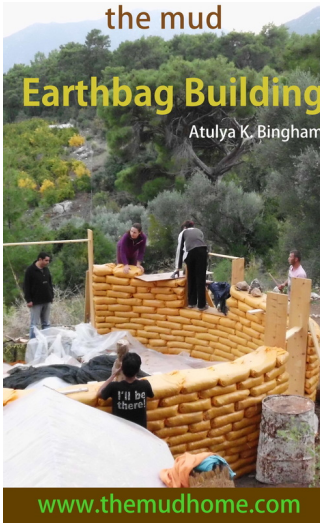

and recipes. It’s still highly debated how the Egyptians built the pyramids. What we moderns are a tad slow to realise is the ancients were in many ways more advanced than we are today.

Remember those images of all those slaves dragging massive stone blocks across the desert? Well, there’s another theory out there fronted by Dr Joseph Davidovits that those great stone blocks weren’t in fact hauled from anywhere and chiselled, but rather made from poured geopolymer cement. Oooh…

Despite the traditionalist backlash, it’s not as far out as it sounds. There’s plenty of evidence of poured limecrete in ancient Egypt, and scientific analysis of the Pyramid blocks has done nothing to dispel Davidovits’ theory. If you’re into this kind of thing, you can read all about it here: **https://watershedmaterials.com/blog/2015/3/31/geopolymer-concrete-egyptian-pyramids-and-a-new-way-forward-for-sustainable-masonry**

Pyramids recipe (courtesy of the Nabataeans)
Lime + crushed limestone (main aggregate) + high alumina clay/diatomaceous earth + natron salt.

There’s some debate whether the Nabataeans were using clay or diatomaceous earth in their mix, so take your pick! But only certain high alumina clays have pozzolanic properties, so lobbing in any old loam you found up the road probably won’t work.

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The Great Wall of China.

2. The Great Wall of China

The Great Wall of China was built over a long time, and the builders used many techniques ranging from rammed earth to mortared stone and brick. It was during the Ming dynasty that lime entered the picture. In this era the Chinese created an exciting lime mortar using glutinous starch.

Recipe (courtesy of the Ming dynasty)

Lime + aggregate/pozzolan (it's unclear from my research but probably clay or
sand) + surprise ingredient, sticky rice!

https://www.acs.org/content/acs/en/pressroom/newsreleases/2010/may/revealingthe-ancient-chinese-secret-of-sticky-rice-mortar.html

The glutinous starch in the sticky rice helps bond this crete, making it tougher and more durable.

Wattle And Daub Yurt

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All the Mud Home How-to posts have been compiled into a PDF package with 75

The Roman baths of Bath UK by lositlady.

3. Roman Limecrete

The Romans did indeed create very slick, tough limecretes often using volcanic substances as their pozzolan of choice. Here's a recipe from the Baths of Baia in Italy.

Recipe from the Baths of Baia

Lime + volcanic tuff (main aggregate) + ceramic fragments.

The Romans pozzolaned the hell out of their limecretes. Both volcanic tuff and crushed ceramics are pozzolans, and this combo created an especially durable crete.

4. India's lime mortar heritage

For truly opulent lime mortar mixtures, look no further than India, which developed a stunningly rich lime tradition still well understood today. Due to the large amount of analysis and research conducted on so many of India's ancient buildings (some folk value their heritage it seems), there are so many detailed lime mortar recipes I had trouble choosing which to add. Here are a couple:

articles and over 200 photos. **You can stil buy it now, and enjoy lifetime access to all the updates.**

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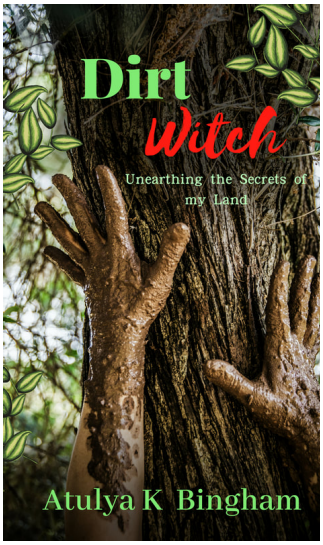


"Entranced! Be inspired by one who's lived and breathed dirt."
Kim Fraser, Get Rugged

Thanjavur Palace Mortar

Substantial testing was done on the mortar for this 17th-century building, as you can read in the link below.

Recipe

Lime + quartz (main aggregate) + feldspar + small quantities of ground limestone and lithic grains.

For more detail see this article:

https://link.springer.com/article/10.1140/epjp/s13360-021-01897-9

The feldspar is the pozzolanic ingredient here. The use of grains such as fenugreek and haritaki seeds are common in Indian lime recipes. Not sure if these were the grains in the Thanjavur palace mortar, but could be.

Limecrete in the mix.

Jaipur Pink City Plaster

This is a plaster rather than a crete, but it’s so luxurious I had

to add it. The Anant Bhagwan Mandir temple in Jaipur is 250 years old and uses a special glossy lime plaster developed in the 17th century called Araish.

Recipe: Quick lime, marble dust, curd, jaggery, and fenugreek.

Jaggery is a high-starch cane sugar which would have a similar bonding effect as sticky rice. The casein in the curd helps bind the lime plaster, giving it a slicker look and preventing dustiness.

What do haritaki and fenugreek seeds do?

I had no idea, so I asked one of India's natural building experts: **Shagun Singh**. Here's her reply: "The haritaki/harad soaked water is added to enhance lime's workability, increase its compressive strength and reduce porosity. While the fenugreek soaked water serves the purpose of enhancing lime's workability and water resistive properties. Jaggery water is added to lime mortars for enhanced binding, but avoided in plasters." Thanks to Priyanka Gunjikar for her input too!

India's plaster experts: India's lime mortar and plaster tradition is vast and detailed, so if you'd like to geek out on that, Thannal Natural Homes is the place to look in the south. Here's a great article to start: **https://thannal.com/plasters-of-rajasthan/**

In the north, get in contact with Geeli Mitti, who run stacks of workshops: **https://geelimitti.in**

Get experimenting!

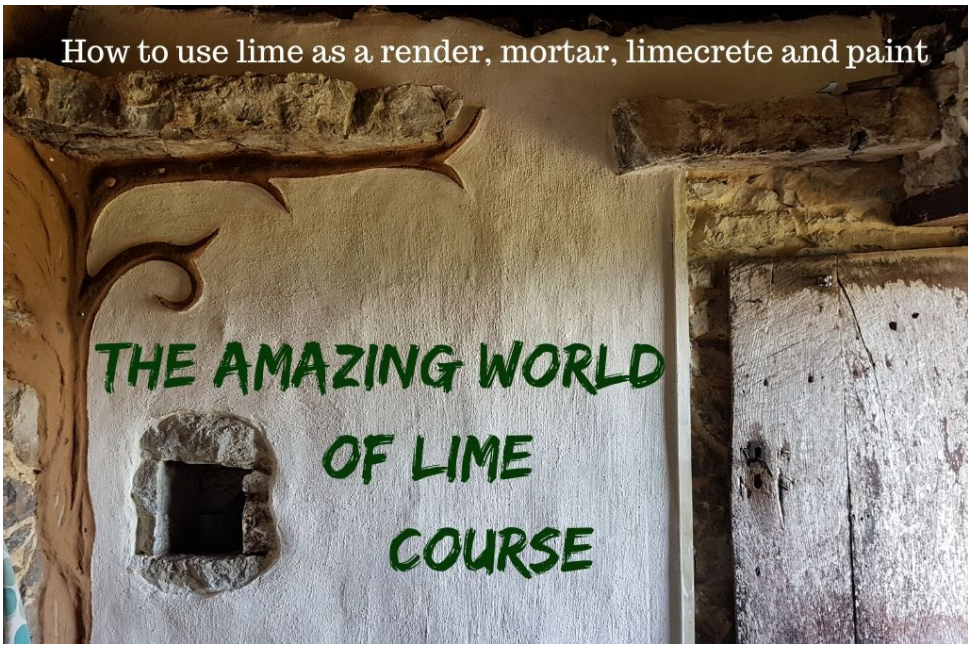
Sooo on that basis, time to get your lime cauldrons out folks. As you can see, there's no single answer to limecrete. But the trick is in the pozzolan.

The Amazing World of Lime

If you want to learn how to use lime as a paint, mortar, render, and crete, then take a look at my *simple* fully-downloadable online lime course.

"This course is worth every penny. It totally cleared everything up for me and gave me the confidence to get started with lime." Kirsty Henderson, author of *Portugal from Scratch.*

HAVE A LOOK AT THE COURSE



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1 Comment

Rishi Raj 29/5/2024 12:29:54 pm

Hi my name is Rishi Raj,
I am currently studying,
My father recently made a house for us but we had to buy air conditioning because it get so hot in it.
Previously we had an old haveli and I never felt got in that.
So I started thinking why our new house gets hot.
I found out that cement and concrete absorbs the heat, and I thought when I'll make a house I'll make it similar to my old haveli, but i couldn't find anything about material and workers and techniques,
Are they lost ?
There are so many mahals in Rajasthan made from the same material, why people are not using those methods?
So many questions, I started searching online and arrived here.

REPLY

Leave a Reply.

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Some blog articles refer to the use of lime. Please note, lime is caustic and can cause burns. Read The Mud Home guide to using lime safely **here**.

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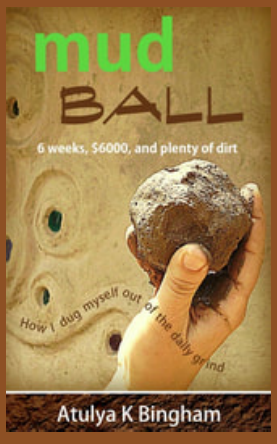

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